U. S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE
California Forest and Range Experiment Station
Division of Forest Insect Research

DOUGLAS-FIR BEETLE
LOWER TRINITY DISTRICT
SIX RIVERS NATIONAL FOREST
SEPTEMBER 1954
APPRAISAL SURVEY

On September 23-24, 1954, an aerial appraisal of Douglas-fir beetle-caused loss in Douglas-fir within the Grouse Creek and Madden Creek drainages, Six Rivers National Forest, was made by G. L. Downing of the California Forest and Range Experiment Station. This survey was made in response to requests from the Forest Service Regional Office and the State Division of Forestry for detailed information on losses within these two drainages. The area contains both government and private lands and is rather inaccessible. Because of this inaccessibility and the ruggedness of the terrain, a helicopter was used in making this survey.

Previous aerial surveys, 1/ with fixed-wing aircraft, had delineated in broad terms the extent of the entire Douglas-fir beetle outbreak in California. These earlier surveys showed that the outbreak covers some 200,000 acres throughout the Klamath River and Trinity River drainages. The major part of the infestation is on national forest lands. The Grouse Creek-Madden Creek drainages are the only part that involve any extensive private holdings. It was deemed desirable, therefore, to obtain fairly accurate information on the location and amount of loss in reference to existing land boundaries for use by the land managing agencies in the furtherance of possible salvage operations.

The helicopter survey was a joint undertaking, decided upon in Berkeley at a meeting of California State Division of Forestry and Forest Service Regional and Station representatives on September 13, 1954. The cost of the helicopter service for this cooperative project was borne by the Forest Service Regional Office and the California State Division of Forestry.

MATERIALS AND EQUIPMENT

A two- to three-place Bell helicopter was used. Kern Copters, Inc., Bakersfield, were owners of the helicopter, which was specially equipped with a 200-horsepower engine. The helicopter was under contract to the Forest Service for fire duty in the area where this survey was made.

1/ Hall, R. C., Downing, G. L., and Eaton, C. B. Douglas-fir beetle, Six Rivers and Klamath National Forests, July 1954, Reconnaissance Survey, California Forest and Range Experiment Station, Berkeley, California, August 9, 1954.

The maps used were U. S. Geological Survey quadrangle sheets, one inch to the mile, 50-foot contour interval, 1951-42 editions. These maps are extremely accurate and proved highly useful for mapping of this nature. Several aluminum sheets, 14" x 16", were used for backing the maps.

Several cameras were used during the operation. These consisted of: (1) an aerial camera for obtaining stereo-pairs of oblique photos; (2) a 4x5 Meridian to take ectachrome transparencies; and (3) an Exakta 35 mm to obtain color transparencies.

METHODS USED

Mapping began at the northern end of the area and progressed southerly, working from one tributary to the next in each drainage. The area is well broken up by canyons and draws and lent itself to this type of mapping.

The mapping was done at heights of 100 to 200 feet above the tree tops and progressed at speeds of 20 to 30 m.p.h. When large groups of infested trees were encountered or difficulties in tracking arose, the helicopter was capable of hovering over any desired area. All currently infested trees, as well as abandoned trees, were counted in each group and this number was circled on the map as close to its true position as could be determined by the observer.

This method is very simple and poses only one difficulty - that of the observer being able to accurately interpret the map locations and ground locations. As an aid in this direction, an orientation flight over the entire area was made prior to any actual mapping.

A. W. Lund of the Forest Service Regional Office took the stereopairs of oblique photographs from the helicopter. For illustrative purposes, several 4x5 Ektachrome and 35 mm Kodachrome pictures also were taken from the helicopter.

RESULTS

Surveyed area.--As can be seen from the attached map, losses are scattered over the entire area with no definite trend toward concentrations on ridges, creek bottoms, or by aspect. Over the entire surveyed area, 230 groups were counted with an average of 14.26 trees per group.

	Infested Acres (Approx.)	Number of Trees Counted
Private	12,320	1,207
Government	35,660	2,074
Total	47,980	3,281

This is .068 trees per acre.

Unsurveyed area.--Illness on the part of the observer prevented completion of the entire survey as originally planned. The unsurveyed area appears to be of the same general loss pattern as the surveyed area; therefore, a few figures for this area have been derived from losses per acre in the surveyed area.

	Infested Acres (Approx.)
Private	5,200
Government	6,060
Total	11,260

The probable number of infested and abandoned trees showing up at the time of the survey within the unsurveyed area is 765.68, based on .068 trees per acre, as found in the surveyed area.

Photography.--The stereo-pairs of oblique photos were taken to determine whether or not they would be useful in tying tree losses into the existing ownership pattern.

The mapping by visual counts from the helicopter has supplied all the necessary information and therefore little use has been made of the stereo-pairs of oblique photos. A slight amount of work with these photos indicates that individual trees would be extremely hard to detect, and that even if they could be counted this system would prove more costly and time-consuming than the visual count method from a helicopter.

TIME AND COSTS

The total helicopter time ran to approximately 10 hours, of which one-third or more was devoted to photographic work. The helicopter charge being $95 per hour, this would bring the total cost, including photographic work, to roughly $1,000. Although no actual figures are available on the exact charges of the mapping phase of the survey, it would probably be about $600. Approximately 48,000 acres were surveyed, costing 1-1/4 cents per acre.

DISCUSSION

As yet, no ground survey of this area has been made, and this is, of course, the next logical step. A ground survey is necessary to determine the accuracy of the helicopter survey and also to obtain volume figures that can be applied to the already existing information. In addition, there is one important factor which has not been mentioned. At the time of the survey, all of the 1954 attacked trees had not faded; therefore, it will be necessary to correct the loss estimates when additional data on unfaded trees have been obtained through ground checking.

Where detailed information from remote and inaccessible areas is desired, a survey by helicopter offers many possibilities. Having had experience in this area with both fixed wing aircraft and helicopter, it is this writer's opinion that, where exacting information concerning tree losses is desired, a helicopter survey will give more detailed information than other types of surveys considering the time, effort and funds required. However, the fact should not be overlooked that a certain amount of ground work is necessary to coordinate results obtained by aerial methods with those actually existing on the ground.

Berkeley, California
December 14, 1954

George L. Downing
Entomologist

Attachment/map

AERIAL SURVEY OF DOUGLAS FIR BEETLE CAUSED LOSSES IN DOUGLAS FIR - MADDEN CREEK AND GROUSE CREEK DRAINAGES, SIX RIVERS NATIONAL FOREST.
SEPTEMBER 1954

LEGEND:

- Private Land
- (14) Number of trees
- Infested area

Cal. For. Exp. Sta.
Div. Forest Insect Res
G.D. 10-15-54

UNSURVEYED AREA
ESTIMATE 766 TREES
Based on .068 trees/acre
as found in SURVEYED area

HEAVY SCATTERED OLD LOSS

R4E R5E T6N T5N T4N T3N